IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of:	Thomas N. Chalin, et al.
Serial No.:	10/600,051
Filed:	June 20, 2003
Entitled:	SUSPENSION SYSTEM HAVING A COMPOSITE BEAM
Group Art Unit:	3616
Examiner:	F. Fleming

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Appellants hereby timely submit this Appeal Brief under the provisions of 37 CFR §41.37 and respectfully request consideration thereof before the Board of Patent Appeals and Interferences. Appellants' Notice of Appeal was filed on 20 August 2010, appealing to the Board from the decision of the examiner, mailed 26 May 2010, finally rejecting the claims of the above-identified patent application. This is a third Appeal Brief in the application.

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REAL PARTY IN INTEREST

The real party in interest is the assignee of the present application, Watson & Chalin Manufacturing, Inc. of McKinney, Texas.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to appellants, the appellants' legal representatives or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 1-53 were originally filed in the present application.

Claims 1-7, 9, 12-46 and 48-53 are pending.

Claims 8, 10, 11 and 47 are canceled.

Claims 3, 5, 12-28, 31-36, 42, 43, 45, 48, 50 and 51 are withdrawn. The Office Action incorrectly lists claim 4 as being withdrawn.

Claims 1, 2, 4, 6, 7, 9, 29, 30, 37-41, 44, 46, 49, 52 and 53 are rejected.

Claims 1, 2, 4, 6, 7, 9, 29, 30, 37-41, 44, 46, 49, 52 and 53 are being appealed.

STATUS OF AMENDMENTS

No amendment has been filed since the 26 May 2010 Office Action.

SUMMARY OF CLAIMED SUBJECT MATTER

In one important aspect of the invention recited in independent claim 1 (an embodiment of which is depicted in FIG. 11 of the drawings), a vehicle suspension system includes an axle 132 and a beam 152 interconnected between the axle and a frame of a vehicle. The embodiment depicted in FIG. 11 (a variation of the embodiment depicted in FIG. 10) is described at page 15, line 7 to page 16, line 6 of the specification.

Therein is described a suspension system 10 for a vehicle having a frame 16 (see FIG. 1; page 6, lines 3-6 and page 14, lines 2-4), the suspension system 10 comprising: an axle 132 (FIG. 11 and page 14, lines 5-6); and a beam 134 interconnected between the vehicle frame 16 and the axle 132 (page 14, lines 7-8, and page 15, line 20 to page 16, line 3), the beam 134 having opposite ends (page 14, lines 7-8; FIGS. 10 & 11), an elongated body 152 extending between the opposite ends (page 15, lines 8-12), and a metal end connection 136, 38 at one of the opposite ends (page 16, lines 1-6), the body 152 being made of a composite material (see page 15, lines 15-19), and the body 152 having a generally I-shaped cross-section (see FIG. 11 and page 15, lines 8-12).

The beam has opposite ends 136, 138, an elongated body 152 extending between the opposite ends, and a metal end connection 38 at one of the opposite ends 136. The body 152 is made of a composite material and has a generally I-shaped cross-section. Beams having generally I-shaped cross-sections are depicted in FIGS. 2, 3A, 6, 7 and 11.

In another important aspect of the invention recited in independent claim 29 and depicted in FIGS. 2 & 3A, the body 32 is made of a composite material and has a cross-section with at least two flanges 50, 52 and a vertical web 54 extending between the flanges. The embodiment depicted in FIGS. 2 & 3A is described at page 5, line 16 to page 9, line 2 of the specification.

Therein is described a suspension system 10 for a vehicle having a frame 16 (see FIG. 1 and page 6, lines 3-6), the suspension system 10 comprising: an axle 24 (page 5, lines 11 and 12); and a beam 30 interconnected between the vehicle frame 16 and the

axle 24 (page 6, lines 3-12), the beam 30 having opposite ends (see FIG. 2), an elongated body 32 extending between the opposite ends (page 6, lines 7-8), an axle end connection 36 at one of the opposite ends (page 7, lines 8-11), and a frame end connection 34 at the other of the opposite ends (page 6, lines 20-21), the body 32 being made of a composite material (page 6, lines 8-19) and having a cross-section with at least two flanges 50, 52 (see FIG. 3A and page 8, lines 10-13) and a generally vertical web 54 extending between the flanges 50, 52 (page 8, lines 10-13).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 2, 4, 6, 7, 9, 29, 30, 37-41, 44, 46, 49, 52 and 53 are rejected under 35 USC §103(a) as being obvious over U.S. Publication No. 2005/0051986 (Galazin) in view of U.S. Patent No. 6,893,733 (Obeshaw).

ARGUMENT

The present invention advances the art of constructing vehicle suspension systems by providing a light weight beam and axle assembly in a suspension system. As part of the advancements in the art, the applicants have described how to make and use several different configurations of light weight beam and axle assemblies (see FIGS. 2-11). As will be appreciated from even a cursory review of the drawings and accompanying description, the applicants have uniquely solved the problems associated with use of composite materials in suspension systems.

One of those problems is how to connect a composite beam to an axle. In the past, a metal suspension beam could be welded to a metal axle. However, if the beam is made of a composite material, it cannot be welded to a metal axle. If the axle were also made of a composite material, then perhaps the composite beam could be just glued to the axle, or perhaps fasteners could be utilized. If the axle is made of metal, then the available options are different, but some may be the same (such as use of fasteners).

Thus, it will be appreciated that this is not a simple matter of substituting one known material for another. The connection between a suspension beam and an axle is a very high stress connection which must endure many years of braking loads, impacts, turning loads, etc., without failure. One cannot merely substitute one material for another in such a connection, particularly when to do so would result in the connected components being made of different materials.

The present applicants have solved this problem, in several embodiments, by constructing the beam so that it has upper and lower flanges 96, 98 which wrap exteriorly about a metal axle connector 44. The metal connector 44 can then be welded to the axle 24. An example depicted in FIGS. 6 & 7 is reproduced on the following page:

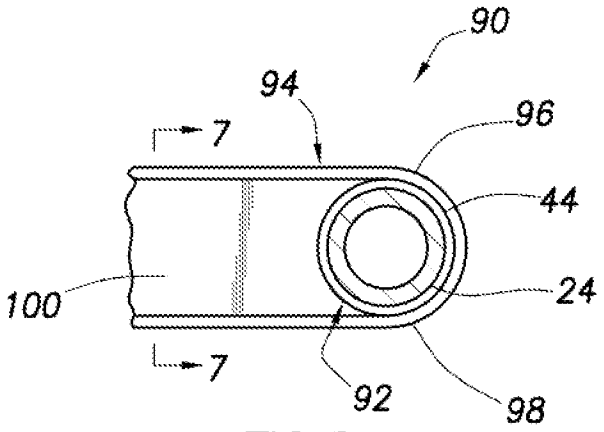


FIG.6

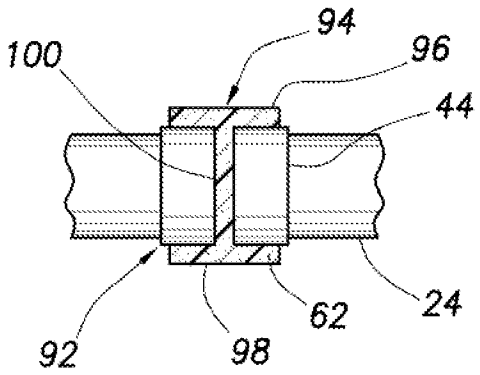


FIG.7

Note that the metal axle connector 44 is securely incorporated into the beam 90 by wrapping the upper and lower flanges 96, 98 outwardly about the metal axle connector 44. In this manner, the axle 24 can be readily connected to the beam 90, for example, by welding the metal axle connector 44 to the axle.

If the axle is made of a composite material, the flanges can wrap exteriorly about the axle (as depicted in FIG. 11), and an opposite end of the beam can be provided with a frame end connection 136 which wraps about a frame coupling structure 38 for receiving a pivot bushing 20 therein (see FIG. 1).

Thus, it will be appreciated that the present specification does much more than simply describe that a suspension system beam can be made of a composite material. Instead, the specification describes several embodiments which uniquely solve various problems associated with use of composite materials in suspension system components.

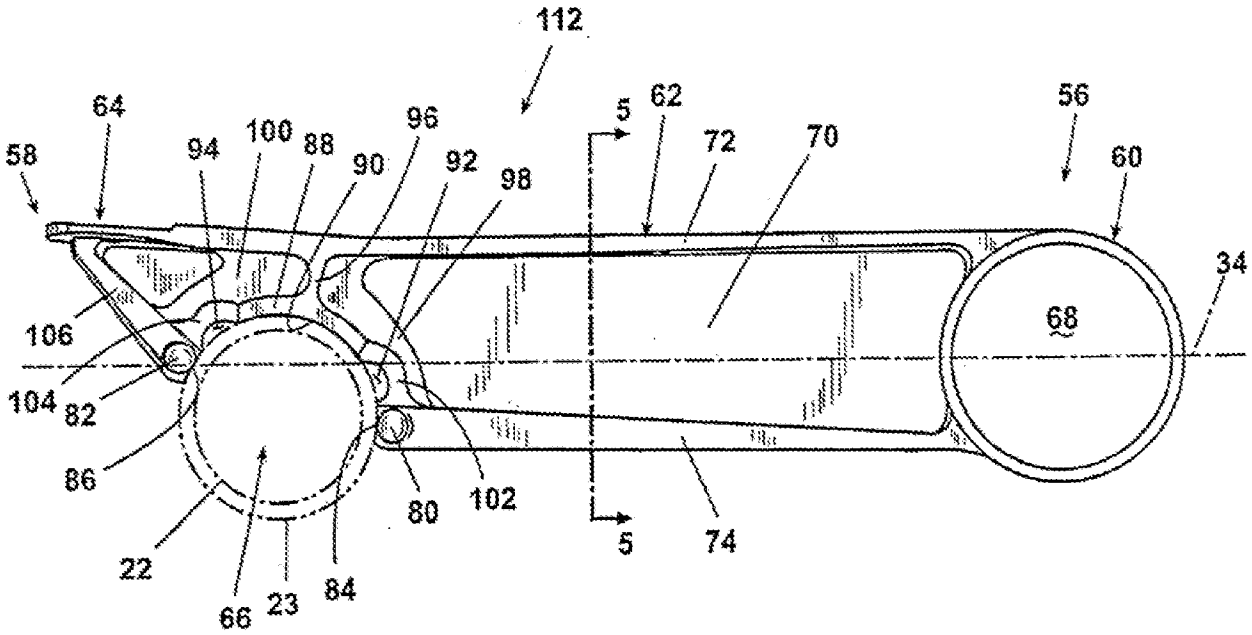
The rejections made in the Office Action merely cite the Galazin reference for its teaching of a typical metal suspension beam, cite the Obeshaw reference for its teaching of a composite material, and then summarily conclude that it would be obvious to make axles and beam bodies of a composite material. However, the claims recite much more than this. The claims recite a particular configuration of a beam in a particular type of

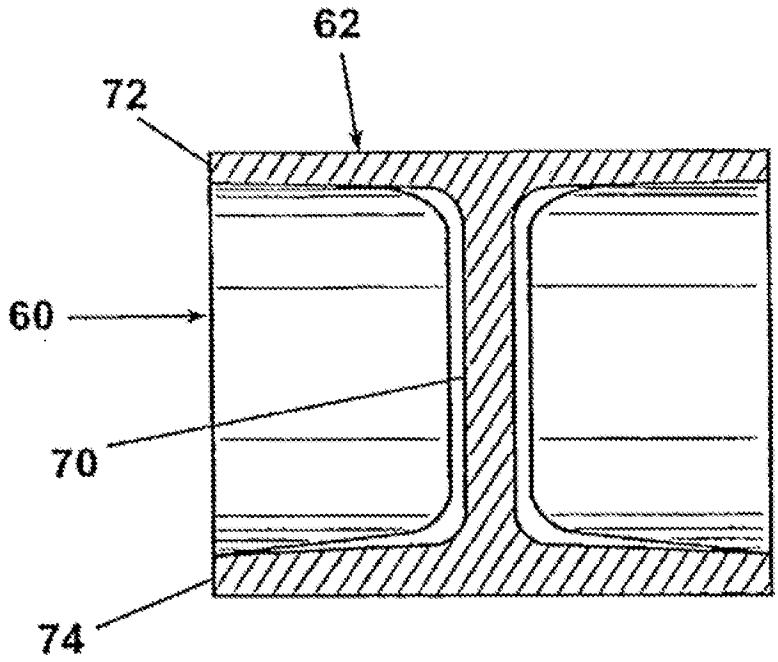
suspension system, and the invention is clearly not rendered obvious in view of the teachings of the Galazin and Obeshaw references.

Claims 1, 2, 4, 6, 7, 9, 29, 30, 37-41, 44, 46, 49, 52 and 53 are rejected under 35 USC §103(a) as being obvious over U.S. Publication No. 2005/0051986 (Galazin) in view of U.S. Patent No. 6,893,733 (Obeshaw).

The first step in the *Graham v. John Deere* factual inquiries, which are used as a background for determining obviousness, is to determine the scope and content of the prior art. In the present case, all of the claims being considered have been rejected as being unpatentably obvious over a proposed combination of the teachings of the Galazin and Obeshaw references. An analysis of these references follows.

Galazin discloses a trailing arm suspension with an optimized I-beam. Finite element analysis is used to precisely configure the shape and thickness of the I-beam flanges and web portions to accommodate the stresses to which the beam will be subjected. Galazin teaches that preferably the trailing arm is fabricated using generally conventional casting methods (see paragraph 0043). Galazin's FIGS. 3 & 5 are reproduced below:





Note that this beam is of one-piece construction. The beam is cast as a single metal component. In fact, this is a central design feature emphasized by Galazin (see paragraph 0002: "The invention relates to vehicle suspension systems, and in particular to suspensions for semi tractor-trails [sic] incorporating single-piece, cast trailing arms."). Because the one-piece, cast metal beam can be welded directly to an axle, Galazin does not even face the problems discussed above of incorporating a composite beam into a suspension system.

Galazin discloses that his one-piece design approach results in the trailing arm at any section being precisely tailored to the design stress to which the beam will be subjected at that section, thereby reducing the trailing arm material to only that necessary at each section and economizing on weight and cost. Galazin goes on to state that the trailing arm is cast as a single piece, (rather than assembling the beam from individual components that are welded together), because this method readily enables the precise beam dimensions determined from the design process to be achieved in the beam as fabricated (see paragraph 0016). Therefore, Galazin clearly advocates a one-piece design and specifically teaches away from assembling a trailing arm from separate components.

Obeshaw describes a crushable tubular structural member made of a composite material. A crushable structural member may be useful, for example, in a steering column (see FIG. 21 and col. 8 lines 38-49), so that the steering column collapses, instead of piercing a driver's body, when a vehicle has a front-end collision. For this purpose, the structural member includes an initiator which causes the member to crush at the location of the initiator (col. 2, lines 14-17).

The Office Action states that Obeshaw discloses a structural member comprising sections made of different materials such as metals and composite materials, with the process for making the structure including any processes known in the art. However, this is a misstatement of what is described in column 12, lines 42-45 of Obeshaw. What Obeshaw actually states at column 12, lines 42-43 is: "The present invention can be made by any suitable process which provides the structure of structural member 2." Obeshaw's structural member 2 is a tubular structural member (col. 3, line 7).

Note that Obeshaw does not describe any I-beam shapes for his structural member. Instead, Obeshaw describes a roll wrapping process to form hollow, tubular structural members (col. 13 lines 13-15, col. 18 line 20 and col. 19 line 33). No person skilled in the art could use the process described by Obeshaw in making an I-beam shaped suspension beam.

Instead, a person of ordinary skill in the art, with the teachings of Obeshaw in hand, would be motivated to design a composite component with a tubular cross-section, not a beam having a generally I-shaped cross-section (as recited in claim 1), or having a cross-section with at least two flanges and a generally vertical web extending between the flanges (as recited in claim 29). This is at least in part because Obeshaw teaches directly away from using an I-beam shape like that described by Galazin.

Claims 1, 2, 4, 6 and 7

Independent claim 1 recites that a suspension system includes, among other features, a beam body made of a composite material, and a metal end connection at one of its opposite ends, with the body having a generally I-shaped cross-section. For example, a sleeve 38 for a pivot bushing 20 can be secured at one end of a composite I-shaped beam body 152, as depicted in FIG. 11.

The claim requires: (1) a body made of a composite material, and (2) a metal end connection located at one of the ends of the body. This type of multi-piece construction is taught away from by Galazin. Instead, Galazin advocates a one-piece cast metal beam.

The claim also requires that the beam body: (1) is made of a composite material, and (2) has a generally I-shaped cross-section. In contrast, Obeshaw only teaches how to make structural components with tubular shapes.

The rejections do not satisfy the requirements set forth in the seminal U.S. Supreme Court case of *Graham v. John Deere* for evaluating whether an invention would have been obvious to a person of ordinary skill in the art at the time the invention was made. These requirements include determining the level of skill of the person having ordinary skill in the art, the scope and content of the prior art, and the differences between the claimed invention and the prior art. Additional considerations may include factors such as failure of others to solve the relevant problem, long felt but unsatisfied need, skepticism of others, teaching away in the prior art, unexpected results, copying, the pace of innovation in the art, commercial success, industry accolades, etc.

In the *Graham v. John Deere* opinion, the Supreme Court also explicitly warned against "slipping into use of hindsight" in obviousness determinations. *Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966). Additionally, in the more recent case of *KSR v. Teleflex*, the Supreme Court has reiterated that an invention's merit is not to be evaluated from a perspective of a person having the benefit of already knowing the solution conceived by the inventor, but rather as it would have been perceived by a

person having only ordinary skill in the pertinent art. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1742-43 (2007).

In the present case, the person having ordinary skill in the art would likely have a bachelor's degree in engineering or a related applied science field, and would likely have several years' experience in designing suspension system components. Such a person would be aware of conventional trailing arm suspension systems.

The scope and content of the prior art have been discussed above. However, it should be reiterated here that Galazin does not describe how the problems of making a suspension beam out of composite materials could be solved, or how a composite material beam body could be used with a metal end connection, and Obeshaw does not describe any composite structure which could have an I-shaped cross-section.

Clearly, neither of the references describes a suspension system arm or beam made of a composite material, with a metal end connection at one of its opposite ends, and with a body of the beam having a generally I-shaped cross-section. Some of these features are described in the cited references, but in no way describing or suggesting how the problems of making a composite suspension beam could be solved.

Instead, each of the references teaches away from the type of suspension system beam described in claim 1. Galazin teaches away from multi-piece suspension beams, and Obeshaw teaches away from I-beam shapes for structural components.

The Board of Patent Appeals and Interferences recently addressed this issue in *Ex Parte Whalen II* (Appeal 2007-4423, July 23, 2008) as follows:

> The U.S. Supreme Court recently held that rigid and mandatory application of the "teaching-suggestion-motivation," or TSM, test is incompatible with its precedents. *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). The Court did not, however, discard the TSM test completely; it noted that its precedents show that an invention "composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *Id.*
>
> The Court held that the TSM test must be applied flexibly, and take into account a number of factors "in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed." *Id.* at 1740-41. Despite this flexibility, however, the Court stated that "it can be important to identify a reason that would have prompted a person of ordinary

> skill in the relevant field to combine the [prior art] elements in the way the claimed new invention does." *Id.* "To facilitate review, this analysis should be made explicit." *Id.*
>
> [W]hen the prior art teaches away from the claimed solution as presented here . . . obviousness cannot be proven merely by showing that a known composition could have been modified by routine experimentation or solely on the expectation of success; it must be shown that those of ordinary skill in the art would have had some apparent reason to modify the known composition in a way that would result in the claimed composition.

In the present case, no convincing reasoning has been presented as to why a person skilled in the art would have been motivated to make the invention recited in the claims. The Galazin reference describes a one-piece cast metal suspension beam. The Obeshaw reference describes a crushable tubular composite structure. There is no reason why a person skilled in the art would use the Obeshaw crushable composite structure in the Galazin suspension system, especially given the fact that each of the references teaches away from doing so.

For at least these reasons, withdrawal of the rejections of claim 1 and its dependents is respectfully requested.

Claim 9

This claim is dependent from claim 1 and, for the reasons discussed above, is not rendered obvious by the teachings of Galazin and Obeshaw. In addition, this claim recites that flanges of the I-shaped cross-section have a greater density of fiber than a web of the cross-section extending between the flanges.

A *prima facie* case of obviousness has not been made out for claim 9, since neither of the Galazin and Obeshaw references describes or suggests this feature. For this additional reason, withdrawal of the rejection of claim 9 is respectfully requested.

Claims 29, 37-41, 44, 46, 49, 52 and 53

Independent claim 29 recites a suspension system which includes a beam having an axle end connection at one end and a frame end connection at an opposite end, with a body of the beam being made of a composite material and having a cross-section with at least two flanges and a generally vertical web extending between the flanges. This claim is not rendered obvious in light of the teachings of the Galazin and Obeshaw references.

As discussed above, Galazin describes a one-piece cast metal suspension beam. Furthermore, Galazin does not describe how a metal end connection could be incorporated into a composite beam body. These deficiencies in the Galazin reference are not cured at all by combining it with the Obeshaw reference. Obeshaw merely describes a crushable tubular composite structure.

The rejections do not satisfy the requirements set forth in the seminal U.S. Supreme Court case of *Graham v. John Deere* for evaluating whether an invention would have been obvious to a person of ordinary skill in the art at the time the invention was made. These requirements include determining the level of skill of the person having ordinary skill in the art, the scope and content of the prior art, and the differences between the claimed invention and the prior art. Additional considerations may include factors such as failure of others to solve the relevant problem, long felt but unsatisfied need, skepticism of others, teaching away in the prior art, unexpected results, copying, the pace of innovation in the art, commercial success, industry accolades, etc.

In the *Graham v. John Deere* opinion, the Supreme Court also explicitly warned against "slipping into use of hindsight" in obviousness determinations. *Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966). Additionally, in the more recent case of *KSR v. Teleflex*, the Supreme Court has reiterated that an invention's merit is not to be evaluated from a perspective of a person having the benefit of already knowing the solution conceived by the inventor, but rather as it would have been perceived by a

person having only ordinary skill in the pertinent art. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1742-43 (2007).

The level of skill in the art, and the scope and content of the prior art have been discussed above. However, it should be reiterated here that Galazin does not describe how the problems of making a suspension beam out of composite materials could be solved, and Obeshaw does not describe any composite structure which could have the flanges and vertical web cross-section required by claim 29.

Clearly, neither of the references describes a suspension system arm or beam made of a composite material, with a metal end connection at one of its opposite ends, and with a body of the beam having a flanges and vertical web cross-section. Some of these features are described in the cited references, but in no way describing or suggesting how the problems of making a composite suspension beam could be solved.

No convincing reasoning has been presented as to why a person skilled in the art would have been motivated to make the invention recited in the claims. The Galazin reference describes a one-piece cast metal suspension beam. The Obeshaw reference describes a crushable tubular composite structure. There is no reason why a person skilled in the art would use the Obeshaw crushable composite structure in the Galazin suspension system, especially given the fact that each of the references teaches away from doing so.

For at least these reasons, withdrawal of the rejections of claim 29 and its dependents is respectfully requested.

Claim 30

This claim is dependent from claim 29 and, for the same reasons discussed above, is not rendered obvious by the proposed combination of the Galazin and Obeshaw references. In addition, this claim recites that the flanges of the beam body wrap outwardly about the axle end connection.

A *prima facie* case of obviousness has not been made out, since neither of the Galazin and Obeshaw references describes this feature of the invention. For this

additional reason, the Board is respectfully requested to direct withdrawal of the rejection of claim 30.

Respectfully submitted,
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Dated: 16 October 2010

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I hereby certify that this correspondence is being filed in the U.S. Patent and Trademark Office electronically via EFS-Web, on October 18, 2010.

/Sally Ann Smith/
_____
Sally Ann Smith

CLAIMS APPENDIX

1. A suspension system for a vehicle having a frame, the suspension system comprising:

an axle; and

a beam interconnected between the vehicle frame and the axle, the beam having opposite ends, an elongated body extending between the opposite ends, and a metal end connection at one of the opposite ends, the body being made of a composite material, and the body having a generally I-shaped cross-section.

2. The suspension system according to claim 1, wherein the end connection is a frame pivot connection.

3. The suspension system according to claim 1, wherein the end connection is an axle connection.

4. The suspension system according to claim 3, wherein the axle is made of an axle composite material.

5. The suspension system according to claim 1, wherein the end connection has a cavity formed therein, the body being received in the cavity.

6. The suspension system according to claim 1, wherein the end connection is received internally in the body.

7. The suspension system according to claim 1, wherein the body has a nonuniform distribution of fibers in the composite material.

8. (canceled)

9. The suspension system according to claim 1, wherein flanges of the I-shaped cross-section have a greater density of fiber than a web of the cross-section extending between the flanges.

10-11. (canceled)

12. The suspension system according to claim 1, wherein the body has a generally tubular cross-section.

13. The suspension system according to claim 12, wherein upper and lower wall portions of the tubular cross-section have a greater density of fiber than central wall portions of the cross-section.

14. The suspension system according to claim 1, wherein the end connection includes a sleeve attached to a body coupling structure.

15. The suspension system according to claim 14, wherein the structure receives the body internally therein.

16. The suspension system according to claim 14, wherein the body receives the structure internally therein.

17. The suspension system according to claim 14, wherein the sleeve and body coupling structure are integrally formed.

18. The suspension system according to claim 14, wherein the sleeve encircles a pivot bushing.

19. The suspension system according to claim 18, wherein the pivot bushing pivotably connects the end connection to the vehicle frame.

20. The suspension system according to claim 18, wherein the pivot bushing pivotably connects the end connection to the axle.

21. The suspension system according to claim 14, wherein the sleeve extends at least partially about the axle.

22. The suspension system according to claim 1, wherein the end connection includes an axle coupling structure attached to the axle, and a body coupling structure attached to the body.

23. The suspension system according to claim 22, wherein the body coupling structure receives the body internally therein.

24. The suspension system according to claim 22, wherein the body receives the body coupling structure internally therein.

25. The suspension system according to claim 22, wherein the axle coupling structure and the body coupling structure are integrally formed.

26. The suspension system according to claim 22, wherein the axle coupling structure extends at least partially about the axle.

27. The suspension system according to claim 22, wherein the axle coupling structure is pivotably attached to the axle.

28. The suspension system according to claim 22, wherein the axle is made of a composite material.

29. A suspension system for a vehicle having a frame, the suspension system comprising:

an axle; and

a beam interconnected between the vehicle frame and the axle, the beam having opposite ends, an elongated body extending between the opposite ends, an axle end connection at one of the opposite ends, and a frame end connection at the other of the opposite ends, the body being made of a composite material and having a cross-section with at least two flanges and a generally vertical web extending between the flanges.

30. The suspension system according to claim 29, wherein the flanges wrap outwardly about the axle end connection.

31. The suspension system according to claim 29, wherein the flanges are attached to an axle coupling structure of the axle end connection.

32. The suspension system according to claim 31, wherein the structure is rigidly attached to the axle.

33. The suspension system according to claim 31, wherein the structure is pivotably attached to the axle.

34. The suspension system according to claim 31, wherein the structure extends at least partially about the axle.

35. The suspension system according to claim 31, wherein the structure is welded to the axle.

36. The suspension system according to claim 31, wherein the axle is made of an axle composite material.

37. The suspension system according to claim 29, wherein the flanges are attached directly to the axle.

38. The suspension system according to claim 37, wherein the web is attached directly to the axle.

39. The suspension system according to claim 37, wherein the flanges extend at least partially about the axle.

40. The suspension system according to claim 37, wherein the axle is made of an axle composite material.

41. The suspension system according to claim 29, wherein the flanges wrap outwardly about the frame end connection.

42. The suspension system according to claim 41, wherein the flanges are attached to a frame coupling structure of the frame end connection.

43. The suspension system according to claim 42, wherein the frame coupling structure extends about a pivot bushing.

44. The suspension system according to claim 29, wherein the flanges have a greater density of fiber than the web.

45. The suspension system according to claim 29, wherein upper and lower end portions of the flanges have a greater density of fiber than the web.

46. The suspension system according to claim 29, wherein the body cross-section is generally I-shaped.

47. (canceled)

48. The suspension system according to claim 29, wherein the frame end connection includes a structure which straddles a hanger bracket attached to the vehicle frame.

49. The suspension system according to claim 29, wherein at least one of the axle and frame end connections is made of metal.

50. The suspension system according to claim 29, wherein each of the axle and frame end connections is made of metal.

51. The suspension system according to claim 29, wherein at least one of the axle and frame end connections has a cavity formed therein, the body being received in the cavity.

52. The suspension system according to claim 29, wherein the body has a nonuniform distribution of fiber therein.

53. The suspension system according to claim 29, wherein the axle is made of a composite material.

EVIDENCE APPENDIX

(none)

RELATED PROCEEDINGS APPENDIX

(none)